Related Application

This application claims the benefit of United States Provisional Application No. 60/149,966, filed August 20, 1999 and United States Provisional Application No. 60/162,789, filed October 29, 1999.

Background

The present invention relates generally to printers which are configured to print labels, tags or the like, and more specifically relates to a printer which is configured to print labels, tags or the like and provides many advantages over the prior art.

It is advantageous to prevent printer downtime, or at least keep downtime to a minimum. Oftentimes, printers which print labels, tags or the like, such as barcode printers, are used in mission-critical applications. In such circumstances, when a printer goes down, it can be quite costly. For example, if a printer configured to print shipping labels runs out of ribbon or otherwise becomes effectively non-functional, it is possible that several hundred boxes will be placed into inventory without identification. In this case, every hour that the system or printer is unavailable can cost hundreds of thousands of dollars or more in lost productivity. Hence, it is advantageous to prevent printer downtime, and in mission-critical

applications, it is generally economically imperative.

Prior art printers are not configured to automatically notify someone, such as an Information Technology (IT) manager who may not be located in close proximity to the printer, when there is a problem. As such, to keep downtime to a minimum, it is imperative to continually monitor a printer on site, and even then downtime may be substantial. For example, in the case where there is an assembly line with an industrial barcode printer at the end of the assembly line, and the ribbon of the printer runs out, the operators on the assembly line may or may not notice right away that the printer has run out of ribbon. Once the problem has finally been detected, it may take awhile for the new ribbon to be located and installed in the printer, resulting in substantial downtime for the assembly line.

Some prior art printers have a web-server therein which provides that an IT manager can remotely view a web page that contains some basic information about the printer. However, these prior art printers do not provide for the unsolicited transmission of critical and non-critical printer data and the routing of that data through a plurality of communication channels to an IT manager. For example, these printers do not automatically send important printer data to an IT manager via e-mail, an Internet-ready pager, a Personal Communications Service (PCS) phone or a

wireless Personal Digital Assistant (PDA), thereby enabling the IT manager to respond to a problem or potential problem immediately, even though the IT manager may not have been actively monitoring the printer at the time. Instead, printers which have a web server therein are configured such that the IT manager must pro-actively monitor the printer and use a device which supports JAVA, such as a personal computer, to check on the status of the printer. Furthermore, even if a problem is detected by the IT manager in this manner, these printers do not provide that the IT manager can thereafter correct the problem by remotely interfacing with the printer. For example, prior art printers also do not provide that an IT manager can remotely access and modify a program which is operating within a printer's operating system. Therefore, if a change needs to be made to the program, the IT manager must access the program in the printer on site, using a computer connected to the printer's serial or parallel port, and this process must be repeated for each printer which the IT manager wants to re-program.

Still further, prior art printers do not provide that an IT manager can view and modify a label format from a remote location. Printers which are adapted to print labels, tags and the like, do so according to a pre-determined, pre-programmed format. For example, a printer which is configured to print shipping labels may be configured to print a shipping label in a format wherein the shipping company's logo, name and address is printed in the upper, left-hand corner of the label and the receiving company's name and address is printed at the center of the label. If the format of the label is to be changed (for example, if the shipping company's logo or address has changed), the IT manager must change the label format on site. After changing the label format, the IT manager typically has the printer print a label to determine whether the label looks acceptable. If not, the IT manager changes the format again, and has the printer print another label. This trial and error process may have to be repeated several times and may take a substantial amount of time. Additionally, if the IT manager wants to change the label format for several printers, the IT manager must repeat the process for each printer.

Presently, there are many different barcode standards being used. Additionally, sometimes a barcode standard is changed (i.e. updated). Prior art barcode printers are configured such that an IT manager cannot remotely download a new or updated barcode rendering algorithm into the printer. Instead, prior art printers are typically sold having one or more barcode rendering algorithms resident therein and, in order to add or update a barcode rendering algorithm, an IT manager must obtain the necessary software, and load the new or updated barcode rendering algorithm into the printer on site, using a computer connected to the printer's serial or parallel port, and this process must be repeated for each printer. Additionally, prior art printers are not configured such that an IT manager can download a barcode rendering algorithm, such as from a printer manufacturer's web site, and thereafter download the barcode rendering algorithm to one or more printers.

Finally, prior art printers are not configured such that an IT manager can remotely access (i.e. upload) the settings of a printer, change the printer settings, and download the new printer settings to the printer or to other printers. Hence, the printer settings of prior art printers cannot be modified remotely, and prior art printers are not configured such that they can be cloned (i.e. to contain the same printer settings) quickly and easily from a

remote location.

Objects and Summary

An object of the present invention is to provide a printer which is configured to automatically transmit data, such as critical and non-critical printer data, and route that data through at least one of a plurality of communication channels and services, such as via e-mail or mobile wireless equipment (e.g. an Internet-ready pager, a Personal Communications Service (PCS) phone or a wireless Personal Digital Assistant (PDA)).

Another object of the present invention is to provide a printer which is configured such that it can be programmed and controlled from a remote location.

Still another object of the present invention is to provide a printer which is configured such that new label formats can be added from a remote location and label formats stored in the printer can be viewed and modified from a remote location.

A still yet other object of the present invention is to provide a printer which is configured such that barcode rendering algorithms can be downloaded to the printer.

A still yet further object of the present invention is to provide a printer which is configured such that printer settings can be viewed and modified from a remote location, and thereafter can be downloaded to the printer and/or to other printers in a network.

Briefly, and in accordance with at least one of the foregoing objects, an embodiment of the present invention provides a printer which is configured to print labels, tags or the like, where the printer includes a housing and electronics in the housing configured to determine a condition of the printer (such as a printer error or warning condition) and thereafter automatically transmit data corresponding to the condition to a remote location, such as over an Intranet, the Internet and/or over a wireless communication network. Preferably, the printer transmits the data via e-mail, to an Internet-ready paging device, to a Personal Communications Service (PCS) phone and/or to a Personal Digital Assistant (PDA). By providing that the printer automatically transmits printer data, an IT manager can be alerted to a problem (i.e. warning condition or printer error) in the printer, and the IT manager can immediately take steps to correct the problem. Preferably, the printer is configured such that at least some problems can be corrected by the IT manager from the remote location by interfacing with the printer. However, some problems may require on site

correction (such as if the printer is out of paper).

Preferably, the printer is programmable and controllable from a remote location over an Intranet, the Internet and/or over a wireless communication network. Preferably, the settings of the printer can be viewed and modified in this manner. Ideally, the printer is programmable and controllable using a web browser on a personal computer connected to an Intranet or to the Internet, and is configured to display web pages on a mobile device, such as a PDA or PCS phone.

Furthermore, preferably a label format which is stored in the printer can be viewed and modified from a remote location. Additionally, preferably the printer is configured such that a barcode rendering algorithm can be downloaded to the printer, preferably in the form of executable code.

Desirably, the printer is configured such it can control one or more peripheral devices in a stand-alone operation and acquire data, and can thereafter, without solicitation from a host, upload the data to the host (when the host is ready to receive the data) via e-mail or TCP/UDP Messaging. Preferably, the data is assembled into one or more databases and processed by the host in other applications.

Preferably, the printer is configured to transmit its settings to a

remote location in XML format so that the printer settings are easy to read and are viewable using, for example, a web browser on a personal computer connected to the Intranet or the Internet. Thereafter, the settings can be modified and downloaded back to the printer, or can be downloaded to other printers in order to facilitate cloning. Preferably, the printer 10 is (and the other printers in the cloning process) are configured such that it parses out the data from the XML and re-sets its settings in accordance with the data which is parsed out of the XML.

Brief Description of the Drawings

The organization and manner of the structure and function of the invention, together with further objects and advantages thereof, may be understood by reference to the following description taken in connection with the accompanying drawings, wherein:

FIGURE 1 is a perspective view of a printer which is in accordance with an embodiment of the present invention;

FIGURE 2 is a schematic diagram of electronics of the printer shown in FIGURE 1;

FIGURE 3 is a diagram showing the printer of FIGURE 1 interfaced with a personal computer at a remote location and interfaced with several mobile wireless devices, including an Internet-ready pager, a PCS phone and a PDA;

FIGURE 4 is a schematic diagram showing a user uploading the settings of the printer of FIGURE 1, viewing and modifying the settings using, for example, a web browser, and thereafter downloading the settings back to the printer, or to other printers in the network to facilitate cloning;

FIGURE 5 is a diagram showing a user uploading, modifying and downloading ZBI, and running/stopping ZBI from a remote location;

FIGURE 6 is a block diagram of a process wherein a user uploads a program which is stored in the printer which the printer uses to print a label, views and modifies the program, and views how the label would look if it were printed and/or prints out the label, and downloads the modified program back to the printer;

FIGURE 7 is a diagram showing the printer of FIGURE 1 connected to a host computer, and showing the printer uploading data to the host; and

FIGURE 8 is a diagram showing a user downloading barcode rendering algorithms from a web site, such as the web site of a printer manufacturer, and thereafter downloading the barcode rendering algorithms to several printers.

Description

While the present invention may be susceptible to embodiment in different forms, there is shown in the drawings, and herein will be described in detail, an embodiment of the invention with the understanding that the present description is to be considered an exemplification of the principles of the invention and is not intended to limit the invention to that as illustrated and described herein.

FIGURE 1 depicts a printer 10 in accordance with an embodiment of the present invention. As will be described in more detail hereinbelow, the printer 10 provides many advantages over the prior art. For example, as will be described, preferably the printer 10 is configured to automatically transmit data, such as critical and non-critical printer data, and route that data through at least one of a plurality of communication channels and services, such as via e-mail or mobile wireless equipment (e.g. an Internet-ready pager, a Personal Communications Service (PCS) phone or a wireless Personal Digital Assistant (PDA)). As such, a person, such as an IT manager, can remain apprised of the condition of the printer 10 without having to pro-actively monitor the printer 10.

Preferably, the printer 10 can also be programmed and controlled from a remote location and label formats stored therein can be viewed and modified from a remote location. Still further, the printer 10 is preferably configured such that barcode rendering algorithms can be downloaded to the printer, and printer settings can be viewed and modified from a remote location. Thereafter, the printer settings can be downloaded to the printer 10, or the printer settings can be downloaded to other printers in a network to facilitate cloning.

As shown in FIGURE 2 which illustrates electronics 20 of the printer 10, the printer 10 includes a label generation and communications microprocessor 30 which communicates with a parallel port 40 and a serial port 50. Of course, other ports may also be provided on the printer 10 and these other ports may also be in communication with the label generation and communications microprocessor 30. As shown, a printserver 60 can be interfaced with the parallel port 40, and the printserver 60 may be connected to an Ethernet network 70 or some other type of network, which is thereafter connected to an Intranet and/or to the Internet, as shown in FIGURE 3. A device 80 such as a personal computer, programmable logic controller (PLC), weigh scale, barcode scanner or other type of device may be connected to the serial port 50 for providing the printer 10 a data stream

which the printer 10 uses to print tags, labels or the like.

The label generation and communications microprocessor 30 communicates with a user interface 90 which consists of buttons and switches which are disposed mainly on the front panel 100 of the printer 10 (see FIGURE 1). The label generation and communications microprocessor 30 also communicates with a printing control microprocessor 110. The printing control microprocessor 110 is in communication with printer mechanics 120 which are generally conventional and well known in the art, and controls the printer mechanics 120 to print tags, labels or the like depending on information the printing control microprocessor 110 receives from the label generation and communications microprocessor 30.

Preferably, the printing control microprocessor 110 is configured to monitor certain components and aspects of the printer mechanics 120, determine whether there is a warning condition, printer error or other problem, and report to the label generation and communications microprocessor 30. For example, preferably the printing control microprocessor 110 is configured to determine whether the printer 10 has run out of paper, is off or on line, has run out of ribbon, whether the printhead is open or is getting too hot, etc. This type of monitoring is generally well known in the art. The configuration of the label generation

and communications microprocessor 30 and the fact that the printing control microprocessor 110 monitors the printer mechanics 120 and the printer 10 is connected to an Intranet and/or to the Internet (see FIGURE 3) provides that the printer 10 can automatically transmit critical and non-critical printer information to one or more remote devices such as, as shown in FIGURE 3, to a personal computer 130, 140 connected to an Intranet or to the Internet, or to an Internet-ready pager 150, a PCS phone 160 and/or a PDA 170, over a wireless communication network. This will be described in more detail later herein.

Preferably, the label generation and communications microprocessor 30 is configured to be programmed and controlled using a pre-determined programming language (identified as "ZPL" in FIGURE 2). As will be described more fully later herein, preferably the printer 10 is configured such that the printer can be programmed and controlled from a remote location, such as over an Intranet, the Internet or over a wireless communications network.

Preferably, the label generation and communications microprocessor 30 includes a web-server (which is generally embedded within the printer's operation system) which is configured to communicate in Hyper Text Markup Language (HTML) (identified as "HTML" in FIGURE 2) to

facilitate the display of web pages over an Intranet, the Internet or over a wireless communication network. As will be described more fully later herein, this provides that a person, such as an IT manager, can view printer settings and can program and control the printer 10 from a remote location using a web browser. Preferably, the printer is configured to provide the data in a simple format which does not require that the receiving device support JAVA. As such, the data can be readily processed and displayed by a pager 150, PCS phone 160 or PDA 170 which may not support JAVA.

Preferably, the printer 10 includes a program and corresponding firmware (identified as "ZBI" in FIGURE 2) which is configured to convert a data stream from one format to another, thereby providing that the printer 10 is compatible with a plurality of different data stream formats. Specifically, the label generation and communications microprocessor 30 receives a data stream, for example, through the serial port 50, such as from a personal computer, weigh scale or barcode scanner. The ZBI may then convert the data stream from one format which would otherwise be incompatible with the printer 10 into another format which is compatible with the printer 10. The label generation and communications microprocessor 30 then uses the converted data to format a label, tag or the like, and communicates with the printing control microprocessor 110 which

thereafter controls the printer mechanics 120 in order to print the label, tag or the like in accordance with the format. United States Provisional Application Serial No. 60/162,789 discloses the ZBI in more detail, and this application is hereby incorporated herein in its entirety by reference.

As discussed above, preferably the printer 10 is configured such that the printer 10 can interface with a device at a remote location via e-mail or TCP/UDP over an Intranet, the Internet or over a wireless communication network. This will now be described in more detail.

As described above, preferably the printer 10 is configured to display web pages over an Intranet, the Internet or over a wireless communication network. Preferably, one of the web pages is configured such that the user can select conditions (such as printer error or warning conditions) of which the user wants to be alerted, and can select how he or she wants to be alerted. Specifically, preferably the web page is configured such that the user can select a condition and can select e-mail and provide the web site with his or her e-mail address, can select PCS phone and provide the web site with his or her phone number, can select pager and provide the web site with the pager number, or can select to be alerted in some other manner via a corporate local area network (LAN) or wide-area network (WAN). Thereafter, if the printer 10 (i.e. the printing control microprocessor 110)

detects the condition, the printer 10 alerts the user of the condition via the means chosen (i.e. sends the user an e-mail, calls the person and displays information on the screen of the PCS phone, pages the person and displays information on the screen of the pager, or alerts the person in some manner via the corporate LAN or WAN) (see FIGURE 3). This provides that the user, such as an IT manager, need not pro-actively monitor the printer 10, and the printer 10 will automatically and immediately inform the user of printer errors or warning conditions via the selected communication channel. Preferably, the web page provides that the user can also elect to be alerted that a condition has been cleared (i.e. a warning condition or printer error which has been detected by the printer 10 has been since corrected). This is advantageous because it may prevent the user, such as an IT manager, from spending time trying to correct a problem which has already been corrected, such as by personnel who are on site at the printer 10. Preferably, another web page is configured such that the user can view the printer's configuration.

Preferably, other web pages are configured such that the user can view and modify printer settings, for example, the printer's general setup, serial communications setup, network communications setup, media setup, calibration, as well as view and modify other printer settings. Additionally,

preferably the user can direct the web page to have the printer 10 print its settings onto a tag, label or the like for viewing on site. Preferably, the web pages are configured such that the user must enter a password to adjust the printer's settings. With regard to the media setup, preferably the user can specify the media type and sensor type as well as the print method and the print width and maximum length within acceptable ranges.

Preferably, as shown in FIGURE 4, the printer 10 is configured such that a user 180 can upload the printer's settings in a format such as XML, can view and modify the settings using a web browser, and can thereafter download the settings back to the printer 10, or to other printers (10a, 10b, 10c, etc.) in the network to facilitate cloning.

Preferably, a web page of the printer 10 is configured such that the user can view the status of memory in the printer 10 and can view a directory listing of different objects which are stored in and used by the printer 10 (i.e. used by the label generation and communications microprocessor 30 and/or the printing control microprocessor 110). Such listings may include programs which run in the printer's operating system, as well as graphic images, fonts, label formats and programs relating to the ZBI (discussed hereinabove).

Preferably, the printer 10 is configured such that the user can direct the printer to stop or run a program, and can add or modify an existing program, wherein the new or modified program is thereafter downloaded to the printer 10 and the printer 10 becomes effectively re-programmed. Preferably, the web pages are configured such that the user must enter a password to add, run, stop or modify any of the programs. FIGURE 5 illustrates a user controlling (i.e. running or stopping) the ZBI from a remote location as well as uploading the ZBI, modifying the ZBI and downloading the modified ZBI to the printer. Preferably, the printer 10 is configured to display the ZBI in the form of a web page at a remote location and provides that a user can direct the ZBI to open TCP/UDP or e-mail ports to the Internet or an intranet to send messages to or from the printer for communicating with other systems on the Internet or intranet.

With regard to label formats, as shown in FIGURE 6, preferably the printer 10 is configured such that a user can upload (see FIGURE 3) label formats which are stored in the printer 10 which the printer 10 uses to print labels, and can thereafter view and modify the format. Preferably, the printer 10 is configured such that after modifying the format, the user can direct the web page (i.e. the printer) to display how the label would look if it were actually printed by the printer (i.e. a label preview), or can direct the

printer to actually print the label. If the label does not look as desired, the user can further modify the format and again view a label preview or print the label until the label looks as desired. Then, the user can direct the web site to download the modified, finalized format to the printer 10 (or to one or more other printers) which thereafter uses the modified format to print labels, tags or the like. Preferably, the printer 10 and web pages are also configured such that the user can format a new label and can download the new label format to the printer for use.

Although the printer 10 is preferably configured such that web pages can be viewed using a web browser, the printer 10 may also be configured to communicate over an Intranet or the Internet (see FIGURE 3) with a computer which is running a utility program which is specifically directed at monitoring the printer 10 and provides for the centralized management of a plurality of printers in a network.

As discussed above and as shown in FIGURE 7, desirably the printer 10 is configured such that the printer 10 can process data in a stand-alone application, such as by receiving data through the serial port 50 (see FIGURE 2) and acting on the information by printing tags, labels or the like, and can thereafter, without solicitation from a host 190, unpload the processed data to the host 190 when the host is ready to receive the data.

Preferably, as shown in FIGURE 8, the printer is configured such that a user can download barcode rendering algorithms to the printer for the printer to use in interpreting data streams and generating a barcode. Preferably, the printer and web pages are configured such that a user can download barcode rendering algorithms, such as from a printer manufacturer's web site, and can thereafter download the barcode rendering algorithms to the printer. As such, it is easy for the user to keep the printer updated with regard to new or updated barcode standards, and can do so from a remote location. Preferably, the printer is configured such that the barcode rendering algorithms can be downloaded to the printer in the form of executable code, and the printer can execute the code to print a barcode from a stream of data, which is possibly received by the printer through the serial port 50 (see FIGURE 2).

As set forth above, United States Provisional Application No. 60/162,789 has been incorporated herein by reference. United States Provisional Application No. 60/149,966 is also hereby incorporated in its entirety by reference in that the application contains additional disclosure about the present invention.

While an embodiment of the present invention is shown and described, it is envisioned that those skilled in the art may devise various modifications without departing from the spirit and scope of the foregoing description.